

Northern Anchovy—The Other Forage Fish

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Abstract

When Puget Sound resource managers say “forage fish” our minds automatically jump to surf smelt and sand lance. I have made the observation over more than a half-century living on Totten Inlet in southern Puget Sound that these two species have all but disappeared, but over the past half-decade have been replaced by a relative newcomer, the northern anchovy. The poster provides information on their life history, pictures to highlight their beauty and abundance, and questions about their importance in the new food web for not only fish, but also birds and marine mammals. Based on their life history and short egg incubation, this species must be reproducing in south Puget Sound.

Introduction

The term “forage fish” (or important prey fish for other marine species) usually brings to mind the upper-intertidal spawning species, surf smelt and sand lance, or the subtidal-spawning Pacific herring. Another important, but less common Puget Sound forage fish species, the northern anchovy, *Engraulis mordax*, has appeared recently in south Puget Sound (Figure 1).

Surf smelt and sand lance have declined over the past 30 years in south Puget Sound (Taylor, 2002). The decline in these species likely affects fish, birds and marine mammals that rely on them as a food source throughout the year (e.g., western grebes). The recent appearance and increasing abundance of the northern anchovy raises speculation that this species may provide an important energy source for marine species.

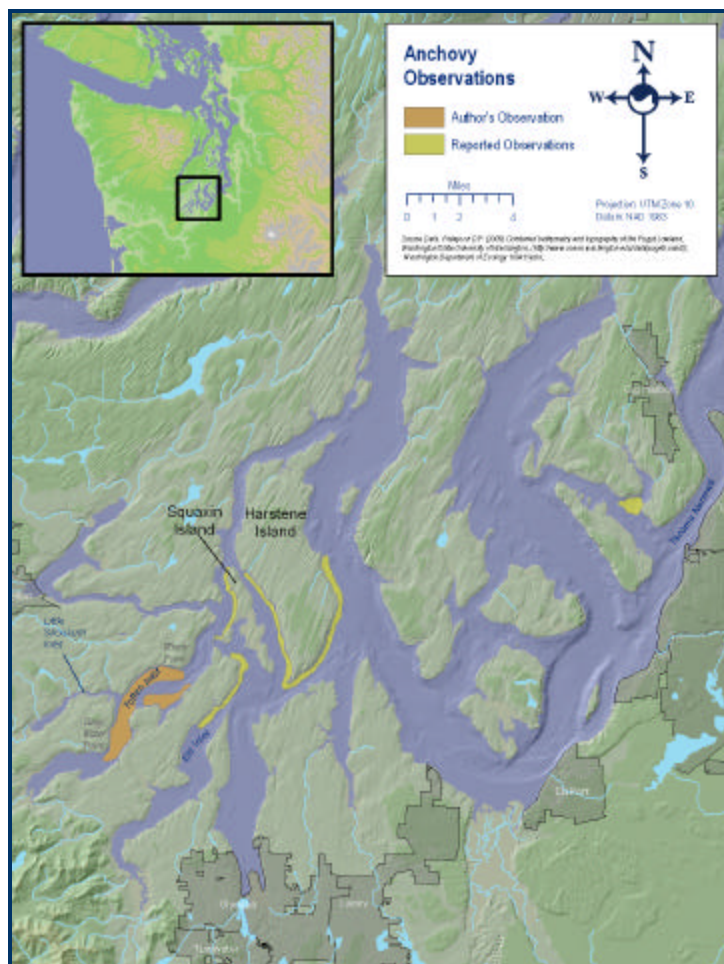


Figure 1: Location of anchovy observations in south Puget Sound.

Biology and Range

- The geographic range of the species reportedly extends from the Gulf of California, Mexico, to the Queen Charlotte Islands, Canada. A single female may spawn several times each year. Fertilization is external and eggs are positively buoyant and pelagic. Eggs incubate two to four days producing three-millimeter larvae that metamorphose to adult form and coloration in about three months. Anchovies occasionally are seen in Puget Sound (Figures 2, 3 and 4), but their reproduction has not been confirmed (WDFW 2005).
- Their spawning is temperature dependent, requiring 10 to 23.3 degrees C, which falls in the temperature range for Totten Inlet (Figure 5).
- A small percentage of larvae reach maturity at the end of the first year (100 mm in length) with the vast majority reaching maturity at the end of the second year (~150 mm). Fish may live as long as seven years but average three to four years (Therriault *et al.*, 2002).
- Anchovies feed similarly to sardines, randomly filtering the water, although some have demonstrated particulate biting, similar to herring (WDFW 2005).
- Anchovies are thought to move inshore in the spring and summer and offshore in the fall and winter. They are a pelagic species and are particularly susceptible to changes in water temperature. Mature fish move offshore in the summer months (Therriault *et al.*, 2002).



Figure 2: School of anchovies (~75mm) in shallows of Totten Inlet.

Figure 3: Anchovies feeding (top-down view) with gill covers extended.

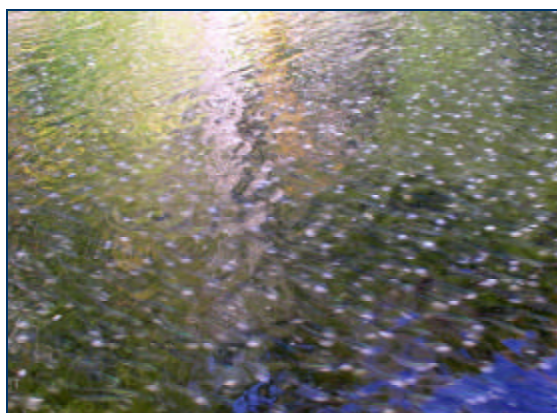
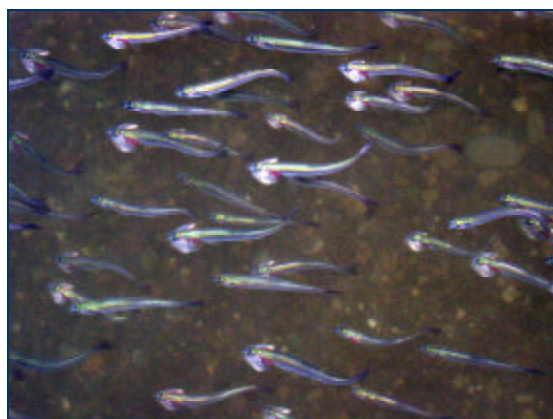


Figure 4: Anchovies feeding on the surface in reflected fall colors.

2004

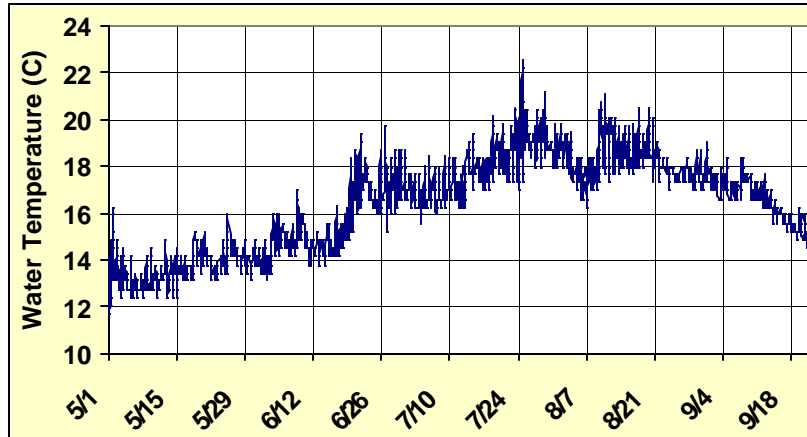
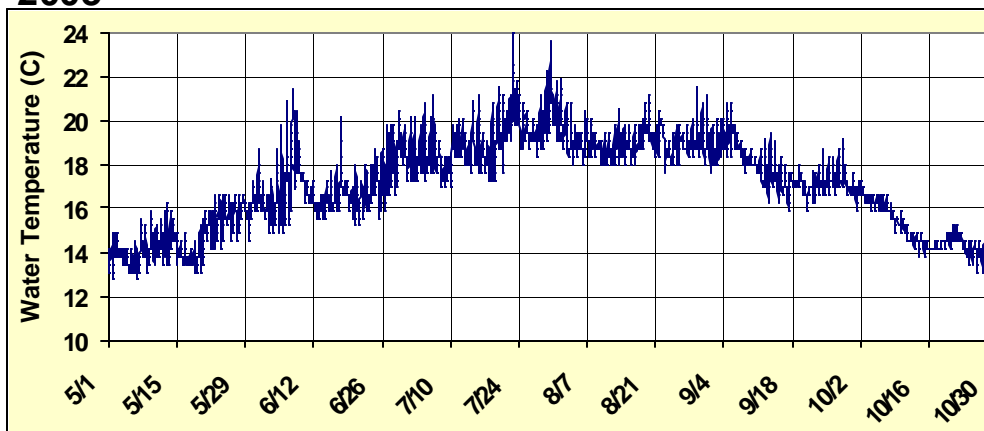


Figure 5: Water temperatures in Gallagher Cove, Totten Inlet, for 2004 and 2003 (recorded at beach elevation of 0.0 ft. mllw, data selected for tidal elevations of +5 ft. or greater) (Cheney 2005).

2003



Observations

- Over the past six years, this species has appeared during the late summer and fall in increasing numbers, mostly visible in the early life stages as 25-100 mm fish. Dense schools of juvenile fish have attracted seals and large flocks of double-crested cormorants and other bird such as gulls, loons, eagles and osprey from September to as late as February the following year (Figures 6 and 7).
- Most observations were made between Steamboat Island and Oyster Bay in Totten Inlet, but fishermen and shoreline residents of Eld, Pickering, and Peale Passage have reported similar sightings of sub-yearling anchovies (Figure 1).



Figure 6: Birds feeding on anchovies near the water's surface in Totten Inlet.

Conclusions

- The sighting of young post-larval anchovies, combined with a short egg developmental stage of 2-4 days, provide evidence that the species reproduces in south Sound and likely spawns at multiple times beginning in the early summer.
- Anchovies are known to be a preferred forage fish with high oil content and their increasing abundance make it a likely food source for other fish such as immature chinook and coho salmon, searun cutthroat trout, dogfish sharks, and many marine birds and mammals.

Questions raised:

- What changes in abundance of predatory birds, mammals and fish might occur as a result of an increase in abundance of a relatively 'new' forage fish, northern anchovy, in south Sound?
- Is there a correlation between increasing temperature in Puget Sound and the appearance of anchovies in Puget Sound?
- Is this phenomenon short-term and episodic, or might anchovies become residents in south sound and populate other areas of Puget Sound or do they migrate further north and into the open ocean?



Figure 7:
Anchovy
school
feeding on
plankton at
the surface.

References

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Taylor, Justin. 2002. Personal Communication.

Therriault, T.W., McDiarmid, A.N., Wulff, W. and D. Hay. 2002. Review of northern anchovy (*Engraulis mordax*) biology and fisheries, with suggested management options for British Columbia. DFO Canadian Science Advisory Secretariat Research Document 2002/112. 27 pp.

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